REMARKS

The present amendment and following remarks are submitted in response to the Office Action dated June 25, 2008, wherein the Examiner rejected Claims 4-6, 8-11, 16-24, 27-30, 34, 39 and 40 all the claims under consideration.

Before addressing the specific grounds of rejection, Applicants take this opportunity to discuss some aspects of the invention that are recited in amended Claim 40. Applicants provide a process for producing an SOI substrate that includes ion implanting p-type or n-type dopants and at least one ion selected from the group consisting of Si, Ge, Ne, Bi, Sn and Xe into a Si-containing substrate, performing an electrolytic anodization process to produce a porous Si region by converting at least a portion of the activated n-type or p-type dopant region into the porous Si region, and then thermal oxidizing the structure to convert at least a portion of the porous Si region into a buried oxide region, wherein a portion of the Si-containing substrate overlying the buried oxide region and a remaining portion of the porous Si region provides a Si-containing overlayer. In an effort to reflect these aspects of the invention, Applicants have amended Claim 40 to recite the step of "thermal oxidizing at a temperature ranging from 650°C to 1350°C to convert *at least a portion of the porous Si region into a buried oxide region*, wherein a portion of the Si-containing substrate overlying the buried oxide region *and a remaining portion of the porous Si region provides a Si-containing overlayer*." Support for the amendment to Claim 40 is found in paragraph 0042 of Applicants' disclosure. Turning to the present grounds of rejection.

Claims 4-6, 8-11, 16-24, 27-30, 34, and 39-40, stand rejected, under 35 U.S.C. § 112, second paragraph, for allegedly being indefinite for failing to comply with the written description requirement. Applicants traverse the aforementioned rejection and submit the following.

Referring to page 3 of the present Office Action, the Examiner notes a typographical error, in which the claims recite "Hf" instead of "HF". Applicants have amended the claims to correct the typographical error.

Still referring to page 3, the Examiner asserts that the term "to a depth ranging from about 250 nm to about 1500 nm from a top of the Si-containing substrate" is indefinite. For the purposes of advancing prosecution Applicants have amended claim 40 to remove the term "about". In light of the amendment to Claim 40, Applicants submit that the §112 rejection has been obviated.

Referring to page 4, the Examiner also objects to the claim for allegedly requiring a sequence other then what was recited in the specification. Applicants submit that during patent examination, the pending claims must be given the broadest reasonable interpretation consistent with the specification. *In re Morris,* 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027(Fed. Cir. 1997); *In re Prater,* 415 F.2d 1393, 162 USPQ 541 (CCPA 1969). Further, definiteness of claim language must be analyzed not in a vacuum, but in light of: (A) The content of the particular application disclosure; (B) The teachings of the prior art; and (C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made. See MPEP 2173.02. Definiteness requires that "the description, clearly allows persons of ordinary skill in the art to recognize that he or she invented what was disclosed". *In re Gosteli,* 872 F.2d 1008, 1012, 10 USPQ2d 1111, 1117 (Fed. Cir. 1989).

Applicants submit that Claim 40 clearly allows persons of ordinary skill in the art to recognize that he or she invented what was disclosed. Applicants further submit that there is no requirement that the claims recite a sequence, which it appears is what the Examiner is requesting. Referring to *Loral Fairchild Corp. v. Sony Corp.*, 181 F.3d 1313, 1322, 50 USPQ2d 1865, 1870 (Fed. Cir. 1999), unless the steps of a method actually recite an order, the steps are not ordinarily construed to require one. Applicants submit that in order for the steps of a process claim to be interpreted as requiring the order in which the steps are recited in the claim, "the sequential nature of the claim steps must be apparent from the plain meaning of the claim language and nothing in the written description suggests otherwise." *Mantech Environmental Corporation v. Hudson Environmental Services, Inc.*, 152 F.3d 1368, 1376, 47 U.S.P.Q.2d 173, 1739 (Fed. Cir. 1998). Applicants note that the terms "first" and "second" were recited in Claim 40 as a means to differentiate the implantation of the p-type and n-type dopant from the implantation of the at least one ion selected from the group consisting of Si, Ge, Ne, Bi, Sn and Xe, and was not intended to require a sequence as wrongly interpreted by the Examiner. In light of the above, and for the purposes of advancing prosecution, Applicants have amended Claims 40 and 39 to remove the terms "first" and "second". In light of the above remarks and amendments, Applicants submit that the claims do not require an order that is outside the scope of the originally filed specification. Applicants submit that the present § 112 rejection has been obviated.

Referring now to the final paragraph of Page 4, the Examiner asserts that the present claims require that the entire porous layer is converted into a buried oxide layer, and that the specification does not support this claim limitation, because the specification recites that a finer porous region becomes buried oxide and an a coarser porous region coalesces into

monocrystalline silicon. As noted above, Applicants have amended Claim 40 to recite "thermal oxidizing at a temperature ranging from 650°C to 1350°C to convert at least a portion of the porous Si region into a buried oxide region." Applicants submit that Claim 40, as currently amended,overcomes the present §112 rejection.

Referring to Page 5, the Examiner has rejected Claims 4-6 under 35 U.S.C. § 112, second paragraph, for allegedly being unclear as to whether the claims positively require a p-type dopant. For the purposes of advancing prosecution, Applicants have amended Claim 4 to recite that the ion implanting is of the p-type dopant and not the n-type dopant, in which the p-type dopant is selected from the group consisting of Ga, Al, B and BF_2. Claims 5 and 6 are both dependent upon Claim 4. Applicants submit that Claim 4 as currently amended overcomes the present §112 rejections to Claims 4-6.

In light of the above, Applicants submit that the § 112 rejections have been obviated and respectfully request withdrawal thereof.

Claims 4-6, 8-11, 16-24, 27-30, 34 and 39-40 stand rejected under 35 U.S.C. §103(a) as allegedly obvious over U.S. Patent No. 5,387, 541 to Hodge et al. ("Hodge et al.") in view of JP 62-245620 to Hiromitsu et al. ("Hiromitsu et al.") and U.S. Patent No. 6,800,518, to Bendernagel et al. ("Bendernagel et al."). Applicants traverse the aforementioned rejection and submit the following.

Applicants submit that the Hodge et al. fails to render Applicants' invention obvious, since Hodge et al. fails to teach or suggest each and every limitation of Applicants' claimed method, as recited in amended Claim 40. Specifically, Hodge et al. fails to teach or suggest a method of fabricating a silicon-on-insulator substrate including a process sequence of ion implanting p-type or n-type dopants into a Si-containing substrate; ion implanting at least one ion

selected from the group consisting of Si, Ge, Ne, Bi, Sn and Xe, wherein the at least one ion may be implanted to below, above or within the depth at which the p-type or n-type dopants are present in the Si-containing substrate; performing an electrolytic anodization process to produce a porous Si region having a porosity of 0.01% or greater at a depth greater than 50 nm from the upper surface of the Si-containing substrate; and performing a thermal oxidation to convert at least a portion of the porous Si region to a buried oxide region, wherein a portion of the Si-containing substrate overlying the buried oxide region and a remaining portion of the porous Si region provides a Si-containing overlayer, as recited in amended Claim 40.

Hodge et al. discloses a process that includes providing a porous silicon layer by anodization (see Figures 1-2, and column 2, line 35, to column 3, line 5, of Hodge et al. reference); ion implantation to produce an amorphous region in the porous Si (see Figures 1 and 2, and column 3, lines 5-35 of the Hodge et al. reference); and annealing to recrystallize the amorphous Si in providing the SOI layer of a silicon on insulator substrate (see Column 3, lines 35-65 of the Hodge et al. reference). The sequence disclosed in Hodge et al. fails to meet Applicants' claimed method, because Hodge et al. produces a porous Si region by anodization prior to ion implantation. Contrary to the method disclosed in Hodge et al., Applicants' method includes an implant of n-type or p-type dopants, as well as another implant of an ion selected from the group consisting of Si, Ge, Ne, Bi, Sn and Xe, prior to the electrolytic anodization, as recited in amended Claim 40. Amended Claim 40 requires a sequence of implantation prior to electrolytic anodization, because the activated n-type or p-type region that is recited in amended Claim 40 is provided by the above noted implantations steps, and Claim 40 specifically recites that the electrolytic anodization process converts at least a portion of the activated n-type or p-type dopant region into the porous Si region. Hence, the sequential nature of the claim steps

relative to the implantation steps and electrolytic anodization is apparent from the plain meaning of the claim, as required by *Mantech Environmental Corporation v. Hudson Environmental Services, Inc.*, 152 F.3d 1368, 1376, 47 U.S.P.Q.2d 173, 1739 (Fed. Cir. 1998). Therefore, in order to meet all the limitations of Claim 40, a process sequence must be provided in which implantation steps provide an activated n-type or p-type region, in which a portion of the activated n-type or p-type region is converted into a porous Si region by an electrolytic anodization process, wherein a thermal oxidation process then converts at least a portion of the porous Si region into a buried oxide region and a remaining portion of the porous Si region into a silicon containing overlayer. Hodge et al. fails to provide this method.

Hodge et al. also fails to teach forming an SOI layer during oxidation. Instead, Hodge et al. relies on a recrystallization step to grow an SOI layer from an amorphous Si region, which does not meet the limitation of an oxidation step that provides both the SOI layer and buried oxide layer, as required by amended Claim 40. Although, Hodge et al. discloses embodiments including oxidation steps following, and prior to, the formation of the SOI layer, the applied reference requires a separate anneal step in a non-oxidizing environment, i.e., an anneal including argon or nitrogen anneal (see column 3, lines 60-65, of Hodge et al.), to produce the SOI layer from a recrystallized growth of Si from an amorphous Si region.

Therefore, since Hodge et al. relies on a separate anneal to provide an SOI layer from recrystallized Si growth, Hodge et al. fails to teach or suggest a method that includes a process that includes ion implanting p-type or n-type dopants into a Si-containing substrate; ion implanting at least one ion selected from the group consisting of Si, Ge, Ne, Bi, Sn and Xe, wherein the at least one ion may be implanted to below, above or within the depth at which the p-type or n-type dopants are present in the Si-containing substrate; performing an electrolytic

anodization process to produce a porous Si region having a porosity of 0.01% or greater at a depth greater than 50 nm from the upper surface of the Si-containing substrate; and performing a thermal oxidation at to convert at least a portion of the porous Si region into a buried oxide region, wherein a portion of the Si-containing substrate overlying the buried oxide region and a remaining portion of the porous Si region provides a Si-containing overlayer, as recited in amended Claim 40.

Hiromitsu fails to fulfill the deficiencies of Hodge et al., because Hiromitsu also fails to teach or suggest each and every limitation of Applicants' method, as recited in amended Claim 40. Hiromitsu discloses a method that forms a Si seed layer atop an insulating substrate. More specifically, Hiromitsu forms a Si-containing seed in an insulating layer, followed by the deposition of an amorphous Si layer atop the insulating layer, wherein the Si-seed embedded in the insulating layer is utilized to convert the amorphous Si layer that is present atop the insulating layer into single crystal Si. Therefore, Hiromitsu is far removed from Applicants' method.

Specifically, Hiromitsu fails to teach or suggest a method of fabricating a silicon-on-insulator substrate comprising ion implanting p-type or n-type dopants into a Si-containing substrate to a depth ranging from 250 nm to 1500 nm from a top surface of the Si-containing substrate; ion implanting at least one ion selected from the group consisting of Si, Ge, Ne, Bi, Sn and Xe, wherein the at least one ion may be implanted to below, above or within the depth at which the p-type or n-type dopants are present in the Si-containing substrate; annealing the n-type or p-type dopants to provide an activated n-type or p-type dopant region in the Si-containing substrate; performing an electrolytic anodization process comprising immersing the Si-containing substrate into an HF-containing solution and applying a current density ranging from 0.05 milliAmps/cm^2 to 50 milliAmps/cm^2 to the Si-containing substrate to produce a porous Si region

having a porosity of about 0.01% or greater at a depth greater than 50 nm from the upper surface of the Si-containing substrate, wherein the electrolytic anodization process converts the activated n-type or p-type dopant region into the porous Si region; and thermal oxidizing at a temperature ranging from 650°C to 1350°C to convert at least a portion of the porous Si region to a buried oxide region, wherein a portion of the Si-containing substrate overlying the buried oxide region and a remaining portion of the porous Si region provides a Si-containing overlayer, as recited in amended Claim 40.

Figures 2(a)-2(d) of the Hiromitsu disclosure, which are directed to the portion of the reference that the Examiner has cited in the present Office Action, illustrate a method of forming an oxide layer atop a semiconductor substrate. Applicants observe that the method illustrated in Figures 2(a)-2(d) and described on Pages 6-7 of the Hiromitsu disclosure, fails to provide a method that includes converting at least a portion of an activated n-type or p-type dopant region into a porous Si region, and then thermal oxidizing the structure to convert at least a portion of the porous Si region into a buried oxide region, wherein a portion of the Si-containing substrate overlying the buried oxide region and *a remaining portion of the porous Si region* provides a Si-containing overlayer, as recited in amended Claim 40. Hiromitsu clearly discloses that the entire portion of the substrate that is implanted during the boron ion implantation 7 or the proton ion implantation are subsequently processed to provide silicon oxide 2, therefore failing to meet the limitation of a method in which at least a portion of the Si-containing substrate overlying the buried oxide region and *a remaining portion of the porous Si region* provides a Si-containing overlayer, as recited in amended Claim 40.

In view of the above, Hiromitsu fails to teach or suggest each and every limitation of Applicants' claimed method, as recited in amended Claim 40.

Turning to Bendernagel et al., Applicants submit that Bendernagel et al. is disqualified from being prior art. Applicants submit that the statute under 35 U.S.C. §103(c) states that:

> Subject matter developed by another person, which qualifies as prior art only under one or more subjections (e), (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Applicants submit that the Bendernagel et al. reference was applied by the Examiner as prior art under 35 U.S.C. §103 via 35 U.S.C. §102(e). Applicants note in this regard that MPEP §706.02(k) states that:

> Effective November 29, 1999, subject matter which was prior art under former 35 U.S.C. 103 via 35 U.S.C. 102(e) is now disqualified as prior art against the claimed invention if that subject matter and the claimed invention "were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person."

In view of this, and the fact the present application and Bendernagel et al. "were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person", the Bendernagel et al. reference is disqualified as a reference under 35 U.S.C. §103(c).

To evidence that the instant application and Bendernagel et al. "were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person", the assignment document of the present application (recordation date September 30, 2003 at Reel 014564, Frame 0494) was compared with the recorded assignment of Bendernagel et al. (recordation date June 30, 2003 at Reel 014226, Frame 0331). In both instances, the inventors conveyed their entire interest to International Business Machines Corporation; therefore establishing common ownership

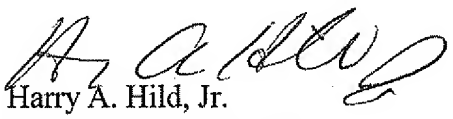
between the instant application and Bendernagel et al. In view of the above information, Bendernagel et al. is disqualified as art.

Applicants submit that the §103 rejection of Claims 4-6, 8-11, 16-24, 27-30, 34 and 39-40 citing the combined disclosures of Hodge et al., Hiromitsu and Bendernagel et al. has been obviated and request withdrawal thereof.

Accordingly, the Examiner is respectfully requested to reconsider the application, withdraw the rejections and issue an immediate a favorable action thereon. If upon review of the application, the Examiner is unable issue an immediate Notice of Allowance, the Examiner is respectfully requested to telephone the undersigned with a view towards resolving any outstanding issues.

An early and favorable action is earnestly solicited.

Respectfully Submitted,



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